Energy efficient plant

Unlocking energy saving potential

Brith Isaksson
Global segment manager
ABB Motion

Brith Isaksson, ABB Motion's global segment manager food and beverage, outlines a two-step process to unlocking the energy saving potential in a process plant.

First, operators need to identify their major energy users. Then they can make fully-informed decisions to upgrade to high-efficiency solutions, including drives and motors, in the areas where they will make the greatest difference.

The energy saving journey begins by identifying exactly what the main energy users are in a plant. This is where adopting the new generation of wireless smart sensors for motors and pumps can make a significant contribution.

In addition to cost-effective plant-wide condition monitoring, smart sensors can work together with the energy monitoring capabilities of variable speed drives (VSDs) to collect a wealth of data to help analyse energy use.

There is also a growing portfolio of other energy optimisation services that plant operators can employ to identify the energy saving potential in pump, fan and compressor applications.

The specific equipment using the most energy will vary from process to process. Typically, the high energy users are motors running pumps and fans, and especially compressors in refrigeration processes. As a general rule of thumb, focusing on pumping and cooling can optimise energy consumption and lower costs by up to 60%.

Tackling high energy users

Once an operator has an understanding of where they need to improve their energy efficiency, they can look at upgrading their equipment. In general, we find that most energy is wasted by inefficiently controlled and oversized motors in pumps, fans and compressors. In these applications, motors are often oversized to cope with a maximum demand that rarely or never occurs. Also, when inefficient control methods such as dampers, vanes or valves are used, the motor runs at full speed and the flow is mechanically restricted.

A common example of inefficiency is when the flow of liquid through a pipeline is reduced by a valve. This is wasteful, because the pump motor keeps running at its nominal speed regardless of the demand. Equally, motors operating refrigeration systems in a food plant often run 24/7 even though the load can vary significantly during the day.

The key to saving energy is to use a VSD to give precise speed control, so that rather than running at full speed when it doesn't need to, the motor is controlled to match the actual process demand.

This is crucial because the speed of an electric motor is strongly tied to the power it consumes. Just a modest speed reduction yields significant energy savings. For example, a pump or a fan running at half speed consumes only one-eighth of the power compared to one running at full speed.

Teaming drives with high efficiency motors

To achieve optimum energy savings, VSDs should be paired with the new generation of high-efficiency motors. For example, an upgrade to IE5 synchronous reluctance motors can offer up to 50% lower energy losses compared to IE2 motors used widely across the food and beverage industry.

IE5 motors can be used in a wide range of demanding food and beverage applications where they offer high efficiency across the whole speed range, even at partial loads. This makes them an ideal upgrade option for standard induction motors in pumps, fans and compressors as well as in more demanding applications like extruders, conches, winches and conveyors.

Investing in energy savings

Combining VSDs with high-efficiency motors can help the food and beverage industry to lower energy costs by up to 60%, as well as reduce carbon dioxide emissions.

This early payback can have a significant effect on profitability, as well as helping the global food and beverage industry to meet its environmental objectives. ●